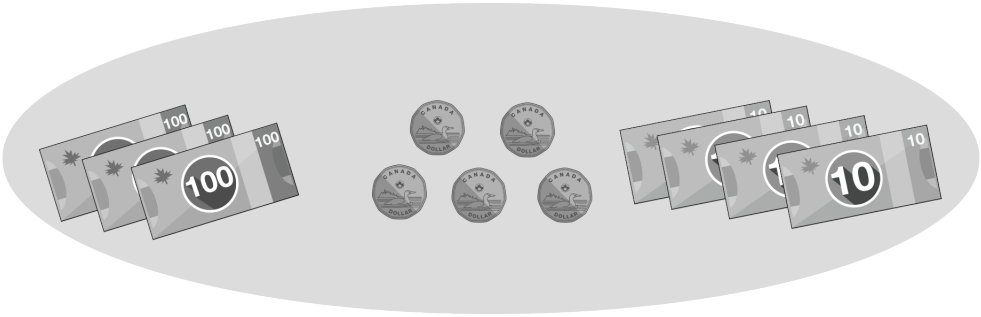
SUM IT UP

Dear parent or guardian: This is a summary of the key ideas your child is learning in mathematics. You can use this summary as background as you support your child's work.

3 Dividing Three-Digit by One-Digit Numbers

When to Divide

- You can use division to solve a problem involving a total amount being shared equally into groups. The solution is the amount in each group.



For example, if 3 people are sharing $345 equally, you know the total ($345) and the number of groups (3), but not the size of the groups (how much money each person would get).

- You can use division to solve a problem involving a total amount being shared into groups of a certain size. The solution is the number of groups.

For example, if you put 545 sticks of gum in equal packages of 5, you know the total (545 items) and the size of the group (5 items), but not the number of groups (the number of packages).

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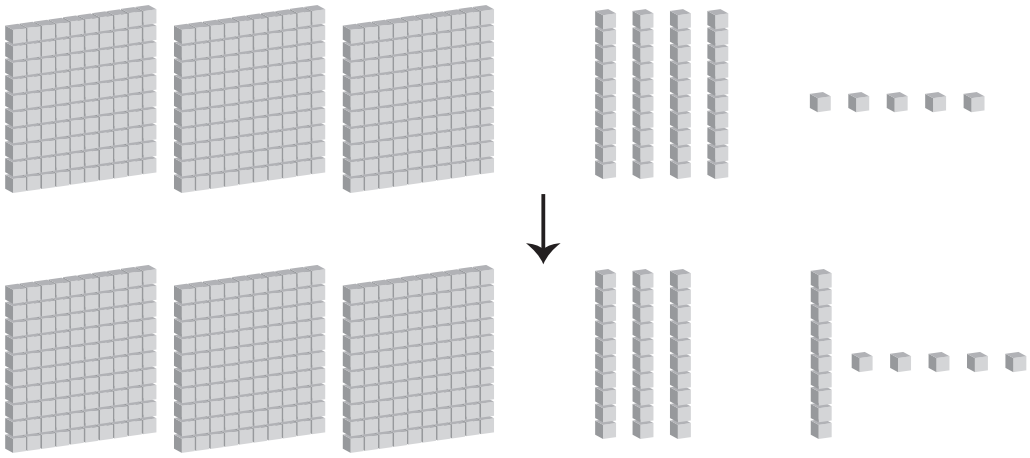
Dividing in Parts

One way to divide involves decomposing, or breaking the dividend into parts that make sense.

For example, here's how you would divide $345 by 3 to solve the money problem above.

You could break up 345 into 300 + 30 + 15 and then divide each part by 3.



30 ÷ 3 = 100 30 ÷ 3 = 10 15 ÷ 3 = 5

345 ÷ 3 = 100 + 10 + 5
= 115

Since multiplication and division are inverse operations, you can check any division by multiplying:
3 × 115 = 345, so 115 is correct.

Here's how you might record the division:

$$3\overline{)300 + 30 + 15} \quad 100 + 10 + 5 = 115$$

The way you break the dividend into parts is up to you. But it makes sense to use parts that you find easy to divide by the divisor.

For example, dividing 345 ÷ 3 using 300 + 30 + 15 is easier than using 300 + 40 + 5, since dividing 30 by 3 and 15 by 3 is easier than dividing 40 by 3 and 5 by 3.

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Conventional Division Algorithms

Here's a conventional division algorithm that also involves decomposing the dividend. But this time you divide the parts in steps and use multiplication to help you.

Here's how you would divide $545 by 5 to solve the gum problem above.

To divide 545 by 5, you could think of 545 as 500 + 45.
500 sticks make 100 packages, since 100 × 5 = 500.
Another 45 sticks make another 9 packages, since 9 × 5 = 45.
So, there are 100 + 9 = 109 packages.

You can check by multiplying: $5 \times 109 = 5 \times 100 + 5 \times 9$
$= 545$

Here's how you might record the division:

$5\overline{)545}$		
$-\ 500$	100	(100 packages of 5, or 100 × 5 = 500)
45		(45 sticks left)
$-\ 45$	$+\ 9$	(9 packages of 5, or 9 × 5 = 45)
0	109	(109 packages with 0 sticks left over)

You could use different parts and take even more steps.

For example:

$5\overline{)545}$		
$-\ 100$	20	(20 × 5 = 100)
445		(445 sticks left)
$-\ 100$	20	(20 × 5 = 100)
345		(345 sticks left)
$-\ 100$	20	(20 × 5 = 100)
245		(245 sticks left)
$-\ 100$	20	(20 × 5 = 100)
145		(145 sticks left)
$-\ 100$	20	(20 × 5 = 100)
45		(45 sticks left)
$-\ 45$	$+\ 9$	(9 × 5 = 100)
0	109	(109 packages with 0 sticks left over)

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Conventional Division Algorithms (continued)

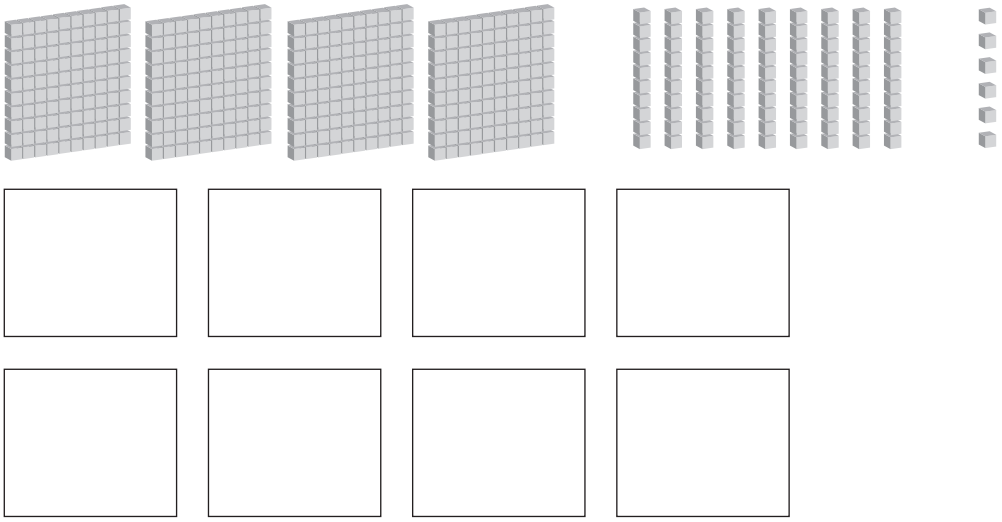
Here is another conventional division algorithm. It involves decomposing the dividend into place-value parts and dividing in steps.

Using base ten blocks to model it helps make sense of the steps.

For example, here's how you would use the algorithm to solve the following problem.

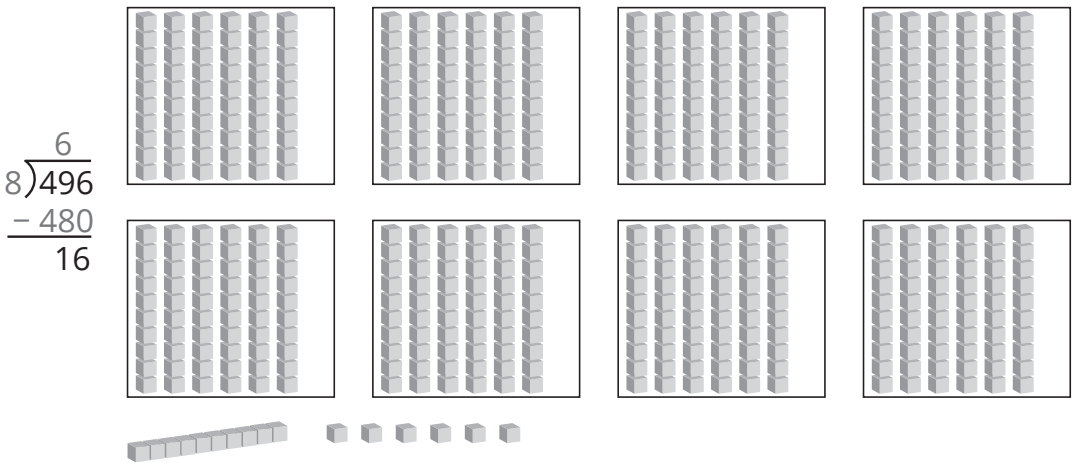
How many books would there be on each shelf if 496 books were put on 8 shelves equally?

Represent 496 with blocks and 8 sharing boxes:



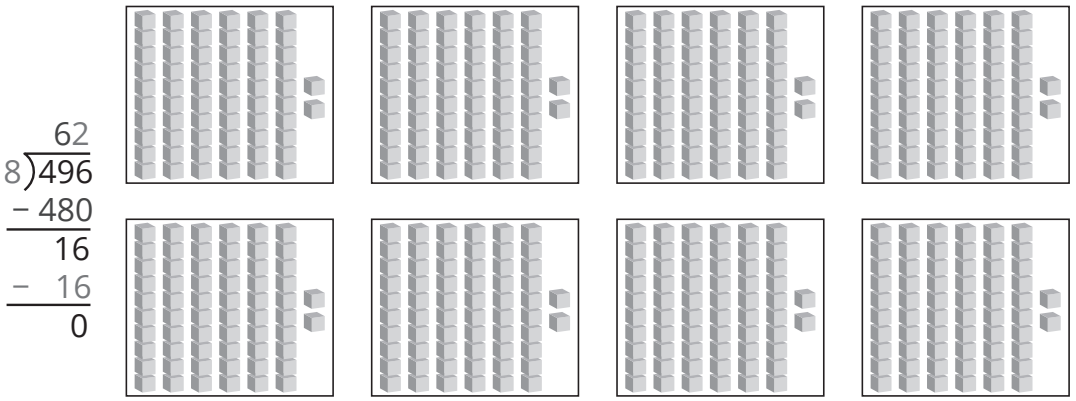
To divide the hundreds blocks into 8 boxes, regroup the 4 hundreds for 40 tens. You now have 49 tens blocks and 6 ones. You can put 6 tens in each sharing box, which leaves 1 ten and 6 ones, or 16.
Record 6 in the tens place of the quotient.

Conventional Division Algorithms (continued)



$$\begin{array}{r} 6 \\ 8\overline{)496} \\ -\,480 \\ \hline 16 \end{array}$$

To divide 1 tens block and 6 ones into 8 boxes, regroup the tens block into 10 ones. You now have 16 ones.
You can put 2 ones blocks in each box.
Record 2 in the ones place of the quotient.



$$\begin{array}{r} 62 \\ 8\overline{)496} \\ -\,480 \\ \hline 16 \\ -\,\,16 \\ \hline 0 \end{array}$$

There will be 62 books on each shelf.

Notice that 496 started out in the place-value parts 400 + 90 + 6. You then regroup as you go in order to decide how many hundreds, how many tens, and how many ones go into each group.

Notes

The conventional, or standard, algorithms are not necessarily preferred, but are simply options, particularly when the numbers being divided do not lend themselves well to some of the other approaches, which call on reasonable number sense and mental-math skills.

Definitions

algorithm: a multistep process for performing a calculation

decomposition: the process of separating a number into parts; for example, 123 = 100 + 20 + 3 and 50 = 2 × 25

dividend: the number you start with when you divide; for example, in 36 ÷ 9 = 4, 36 is the dividend

divisor: the number you divide by when you divide; for example, in 36 ÷ 9 = 4, 9 is the divisor

inverse operations: operations that undo each other, such as multiplication and division; for example, since 12 ÷ 4 = 3, then 3 × 4 = 12

quotient: the result of dividing; for example, in 20 ÷ 5 = 4, 4 is the quotient

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